CLAIMS

What is claimed is:

1. A control system for regulating a dispenser comprising a feeder bowl and a plurality of dispensing paths comprises:

a control unit for controlling each of a feeder bowl vibration device for vibrating said feeder bowl, a rotation drive for rotating said dispensing paths, and at least one dispensing path vibration device for vibrating said dispensing paths, such that said feeder bowl receives a plurality of items and supplies those items uniformly to each of said dispensing paths, and said dispensing paths dispense said items singularly.

2. The control system of claim 1, wherein said control unit controls a rotational speed of said rotation drive, a vibration of said feeder bowl vibration device, and a vibration of said at least one dispensing path vibration device.

3. The control system of claim 1, wherein said control unit controls a rotational speed of said rotation drive according to a desired number of containers to be filled by said dispenser, and a vibration of said feeder bowl vibration device and said at least one dispensing path vibration device according to said rotational speed and a physical characteristic of each of said items to be dispensed, such that said dispensing paths dispense said items singularly.

4. The control system of claim 1, wherein said at least one dispensing path vibration device comprises a plurality of dispensing path vibration devices, each of said dispensing path vibration devices vibrating one of said dispensing paths, and further wherein said control unit controls a vibration of said feeder bowl vibration device and each of said dispensing path vibration devices, such that said dispensing paths dispense said items singularly.

5. The control system of claim 4, wherein each of said dispensing paths comprises at least one channel for dispensing items singularly and each of said channels has a substantially V-shaped or U-shaped cross-section.

6. The control system of claim 1, wherein said control unit controls a vibration of said feeder bowl vibration device and said at least one dispensing path vibration device in a substantially horizontal plane.

7. The control system of claim 1, wherein said control unit controls a vibration of said feeder bowl vibration device and said at least one dispensing path vibration device in a substantially vertical plane.

8. The control system of claim 1, wherein said control unit controls a vibration of said feeder bowl vibration device and said at least one dispensing path vibration device in a first plane and a second plane and wherein said first plane and said second plane are transverse to one another.

9. The control system of claim 1, wherein said control unit controls a frequency of vibration of said feeder bowl vibration device and said at least one dispensing path vibration device.

10. The control system of claim 1, wherein said control unit controls a frequency of vibration of said feeder bowl vibration device and said at least one dispensing path vibration device in a first plane and a second plane.

11. The control system of claim 1, wherein said control unit controls a magnitude of vibration of said feeder bowl vibration device and said at least one dispensing path vibration device.

12. The control system of claim 1, wherein said control unit controls a magnitude of vibration of said feeder bowl vibration device and said at least one dispensing path vibration device in a first plane and a second plane.

13. The control system of claim 1, wherein said control unit controls a frequency and a magnitude of vibration of said feeder bowl vibration device and said at least one dispensing path vibration device in a first plane and a second plane.

14. The control system of claim 1, further comprising:

a memory for storing a plurality of vibrational settings for said feeder bowl vibration device and said at least one dispensing path vibration device, wherein each of said vibrational settings is proportionate to a physical characteristic of said items to be dispensed; and

an input unit for selecting one of said vibrational settings and transmitting said vibrational setting to said control unit,

wherein said control unit adjusts a vibration of said feeder bowl vibration device and a vibration of said at least one dispensing path vibration device, so that said feeder bowl dispenses said items uniformly and said dispensing paths dispense said items singularly.

15. The control system of claim 14, wherein said vibrational setting comprises:

a first vibrational setting for said feeder bowl vibration device; and

a second vibrational setting for said at least one dispensing path vibration device.

16. The control system of claim 15, wherein said first vibrational setting comprises a first vibrational frequency and a first vibrational magnitude and said second vibrational setting comprises a second vibrational frequency and a second vibrational magnitude.

17. The control system of claim 1, further comprising:

a memory for storing a plurality of rotational speed settings for said rotation drive; and

an input unit for selecting one of said rotational speed settings and transmitting said rotational speed setting to said control unit,

wherein said control unit adjusts a rotational speed of said rotation drive, in response to said selected setting.

18. The control system of claim 1, further comprising:

a first vibration sensor for measuring a first vibration component generated by said feeder bowl vibration device and transmitting signals describing said first vibration component to said control unit;

a second vibration sensor for measuring a second vibration component generated by said at least one dispensing path vibration device and transmitting signals describing said second vibration component to said control unit;

a rotation sensor for measuring a rotational speed of said rotation drive and transmitting signals describing said rotational speed to said control unit; and

a sensing unit positioned at a distal end of each of said dispensing paths for counting each of said singularly-dispensed items and transmitting said count to said control unit,

wherein said control unit controls said first vibration component of said feeder bowl vibration device and said second vibration component of said at least one dispensing path vibration device, and a rotational speed of at least one of said rotation drive and said dispensing paths, in response to said signal received from each of said sensors and said count received from said sensing unit, such that said dispensing paths dispense said items singularly.

19. The control system of claim 1, further comprising:

a sensing unit positioned at a distal end of each of said dispensing paths, said sensing unit measuring a physical characteristic of each of said singularly-dispensed items and transmitting each of said measurements to said control unit.

20. The control system of claim 19, wherein said control unit determines whether each of said measurements describes a singularly-dispensed item and controls a vibration component of said feeder bowl vibration device and said at least one dispensing path vibration device, so that said dispensing paths dispense said items singularly.

21. The control system of claim 19, wherein said control unit determines whether each of said measurements corresponds to a singularly-dispensed item and controls a vibration of said feeder bowl and said dispensing paths, so that said dispensing paths dispense said items singularly.

22. The control system of claim 19, wherein said physical characteristic comprises at least one of a volume, a density, and a weight.

23. The control system of claim 1, wherein said control unit adjusts a rotational speed of said rotation drive and a frequency and a magnitude of vibration of said feeder bowl vibration device and said at least one dispensing path vibration device, so that said dispensing paths dispense said items singularly.

24. The control system of claim 1, further comprising:

a sensing unit positioned at a distal end of each of said dispensing paths, wherein said sensing unit measures a physical characteristic of each of said singularly-dispensed items and transmits each of said measurements to said control unit,

wherein said control unit counts each of said items whose measurement is within a predetermined range of physical characteristics and identifies each of said items whose measurement is greater than or less than said predetermined range of physical characteristics.

25. The control system of claim 37, wherein said control unit counts each of said items in groups of predetermined quantities for each of said dispensing paths and identifies any of said groups of items comprising at least one item the measurement of which is greater than or less than said predetermined range of physical characteristics.

26. The control system of claim 25, wherein said control unit identifies for diversion any of said groups of predetermined quantities in which at least one of said items comprises a measurement greater than or less than said predetermined range of physical characteristics.

27. The control system of claim 1, further comprising:

a sensing unit positioned at a distal end of each of said dispensing paths, said sensing unit measuring a physical characteristic of each of said singularly-dispensed items and transmitting each of said measurements to said control unit; and

a dispensing head positioned at said distal end of each of said dispensing paths to receive said singularly-dispensed items,

wherein said control unit counts each of said items whose measurement is within a predetermined range of physical characteristics, collects said items into groups of predetermined quantities, and activates said dispensing head to direct said predetermined quantity of items to a container.

28. The control system of claim 1, further comprising:

a plurality of dispensing heads for receiving said singularly-dispensed items; and

a plurality of sensing units for measuring a physical characteristic of each of said dispensed items and each measurement to said control unit,

wherein said control unit counts each of said items whose measurement is within a predetermined range of physical characteristics, collects said items into in groups of predetermined quantities, and activates each of said dispensing heads to dispense said groups of predetermined quantities.

29. A method of controlling the dispensing items comprising the steps of:

delivering items onto a feeder bowl at a predetermined rate of delivery;

rotating a feeder bowl at a predetermined rotational speed;

vibrating said feeder bowl at a predetermined feeder bowl vibrational setting, so that said items are dispensed uniformly to a plurality of dispensing paths positioned around said feeder bowl; and

vibrating said dispensing paths at a predetermined dispensing path vibrational setting, so that said dispensing paths dispense said items singularly.

30. The method of claim 29, wherein the steps of vibrating said feeder bowl and said dispensing paths comprises the steps of:

operating a feeder bowl vibration device at said predetermined feeder bowl vibrational setting; and

operating at least one dispensing path vibration device at said predetermined dispensing path vibrational setting.

31. The method of claim 29, wherein the step of rotating said feeder bowl further comprises the steps of:

operating a feeder bowl rotation drive at said predetermined rotational speed.

32. The method of claim 29, wherein the step of vibrating said dispensing paths comprises the step of vibrating each of said dispensing paths at said predetermined dispensing path vibrational setting.

33. The method of claim 29, wherein the step of vibrating said feeder bowl at a predetermined feeder bowl vibrational setting comprises the step of:

vibrating said feeder bowl in a first plane and a second plane,

wherein said first plane and said second plane are transverse.

34. The method of claim 29, wherein the step of vibrating said dispensing paths at a predetermined dispensing path vibrational setting comprises the step of:

vibrating each of said dispensing paths in a first plane and a second plane,

wherein said first plane and said second plane are transverse.

35. The method of claim 29, wherein the step of vibrating said feeder bowl at a predetermined feeder bowl vibrational setting comprises the step of:

vibrating said feeder bowl in a substantially horizontal plane and a substantially vertical plane.

36. The method of claim 29, wherein the step of vibrating said dispensing paths at a predetermined dispensing path vibrational setting comprises the step of:

vibrating each of said dispensing paths in a substantially horizontal plane and a substantially vertical plane.

37. The method of claim 29, wherein the steps of vibrating said feeder bowl at a predetermined feeder bowl vibrational setting and vibrating said dispensing paths at a

predetermined dispensing path vibrational setting comprises the steps of vibrating said feeder bowl and said dispensing paths at predetermined respective vibrational frequencies.

38. The method of claim 29, wherein the steps of vibrating said feeder bowl at a predetermined feeder bowl vibrational setting and vibrating said dispensing paths at a predetermined dispensing path vibrational setting comprises the steps of vibrating said feeder bowl and said dispensing paths at predetermined respective vibrational magnitudes.

39. The method of claim 29, wherein said steps of vibrating said feeder bowl at a predetermined feeder bowl vibrational setting and vibrating said dispensing paths at a predetermined dispensing path vibrational setting comprises the steps of:

retrieving a predetermined feeder bowl vibrational setting and a predetermined dispensing path vibrational setting from a memory;

operating a feeder bowl rotation drive at said predetermined feeder bowl vibrational setting; and

operating a dispensing path vibration device at said predetermined dispensing path vibrational setting,

wherein each of said vibrational settings is proportionate to a physical characteristic of each of said items to be dispensed.

40. The method of claim 39, further comprising the steps of:

measuring a physical characteristic of each of said items dispensed from each of said dispensing paths; and

adjusting each of said vibrational settings, so that said dispensing paths dispense said items singularly.

41. The method of claim 39, wherein the step of retrieving a predetermined feeder bowl and dispensing path vibrational setting comprises the steps of:

retrieving a predetermined vibrational frequency and magnitude for said feeder bowl and a predetermined vibrational frequency and magnitude for each of said dispensing paths, wherein each of said predetermined vibrational frequencies and magnitudes is proportionate to a density of each of said items to be dispensed.

42. The method of claim 39, wherein the step of retrieving a predetermined feeder bowl and dispensing path vibrational setting comprises the steps of:

retrieving a predetermined vibrational frequency and magnitude for said feeder bowl and a predetermined vibrational frequency and magnitude for each of said dispensing paths, wherein each of said predetermined vibrational frequencies and magnitudes is proportionate to a volume of each of said items to be dispensed.

43. The method of claim 39, wherein the step of retrieving a predetermined feeder bowl and dispensing path vibrational setting comprises the steps of:

retrieving a predetermined vibrational frequency and magnitude for said feeder bowl and a predetermined vibrational frequency and magnitude for each of said dispensing paths, wherein each of said predetermined vibrational frequencies and magnitudes is proportionate to a weight of each of said items to be dispensed.

44. The method of claim 29, further comprising the steps of:

measuring a vibrational component of said feeder bowl and transmitting said measurements to a control unit;

measuring a vibrational component of each of said dispensing paths and transmitting said measurements to said control unit;

measuring a rotational speed of said feeder bowl and transmitting said measurements to said control unit;

counting each of said singularly-dispensed items and transmitting said count to said control unit;

adjusting said vibration of said feeder bowl and each of said dispensing paths and said rotational speed of said feeder bowl, in response to said count, so that said dispensing paths dispense said items singularly.

45. The method of claim 30, further comprising the steps of:

measuring a vibrational component of a feeder bowl vibration device that vibrates said feeder bowl and transmitting said measurements to a control unit;

measuring a vibrational component of a dispensing path vibration device that vibrates each of said dispensing paths and transmitting said measurements to said control unit;

measuring a rotational speed of a rotation drive that rotates said feeder bowl and transmitting said measurements to said control unit;

counting each of said singularly-dispensed items and transmitting said count to said control unit;

operating said feeder bowl vibration device said dispensing path vibration device, in response to said count, so that said dispensing paths dispense said items singularly.

46. The method of claim 29, further comprising the steps of:

counting each of said singularly-dispensed items;

transmitting said count to said control unit; and

adjusting said predetermined vibrational settings of said feeder bowl and each of said dispensing paths, and said predetermined rotational speed setting of said feeder bowl, in response to said count, so that said dispensing paths dispense said items singularly.

47. The method of claim 29, further comprising the steps of:

counting each of said singularly-dispensed items;

transmitting said count to said control unit; and

controlling a vibration of a feeder bowl vibration device of said feeder bowl and a dispensing path vibration device of each of said dispensing paths, in response to said count, so that said dispensing paths dispense said items singularly.

48. The method of claim 29, further comprising the step of:

measuring a physical characteristic of each of said singularly-dispensed items; and

transmitting said measurements to a control unit.

49. The method of claim 48, further comprising the steps of:

determining whether each of said measurements corresponds to a singularly-dispensed item; and

adjusting said predetermined vibrational settings of said feeder bowl and each of said dispensing paths, in response to said measurements, so that said dispensing paths dispense said items singularly.

50. The method of claim 48, wherein the step of measuring a physical characteristic of each of said singularly-dispensed items comprises the step of measuring at least one of a volume of each of said singularly-dispensed items, a density of each of said singularly-dispensed items, and a weight of each of said singularly-dispensed items.

51. The method of claim 29, further comprising the steps of:

measuring a physical characteristic of each of said singularly-dispensed items;

transmitting each of said measurements to a control unit; and

counting each of said items whose measurement is within a predetermined range of physical characteristics; and

identifying each of said items whose measurement is greater or less than said predetermined range of physical characteristics.

52. The method of claim 29, further comprising the steps of:

measuring a physical characteristic of each of said singularly-dispensed items;

transmitting each of said measurements to a control unit;

receiving said singularly-dispensed items in a dispensing head positioned at a distal end of each of said dispensing paths;

counting each of said items whose measurement is within a predetermined range of physical characteristics in groups of predetermined quantities; and

identifying any of said predetermined quantities with at least one item whose measurement is greater or less than said predetermined range.

53. The method of claim 52, further comprising the step of:

activating said dispensing head to direct said predetermined quantities in which each of said items has a measurement within said predetermined range of physical characteristics to a container.

54. The method of claim 52, further comprising the step of:

activating said dispensing head to divert any of said predetermined quantities in which each of said items has a measurement that is greater than or less than said predetermined range of physical characteristics away from a container.

55. A control system for regulating a rotary, vibratory dispenser comprising a feeder bowl and a plurality of dispensing paths comprises:

a control unit for controlling each of a rotation drive for rotating said feeder bowl, a feeder bowl vibration device for vibrating said feeder bowl, and at least one dispensing path vibration device for vibrating said dispensing paths, so that said feeder bowl may receive a

plurality of items and supplies those items uniformly to each of said dispensing paths, and so that said dispensing paths dispense said items singularly.